26. (Newly Added) The method of cleaning an injection mold according to Claim 4, wherein, in the step of configuring the operating controls, the granule size is kept at approximately 0.020 inches in diameter for cleaning a vent of the preform.

27. (Newly Added) The method of cleaning an injection mold according to Claim 5, wherein, in the step of configuring the operating controls, the gas flow rate is kept at approximately 25 SCFM for cleaning a vent of the preform.

28. (Newly Added) The method of cleaning an injection mold according to Claim 6, wherein, in the step of positioning a nozzle tip of a hand tool, the position of the nozzle tip is kept approximately 1.0 inch from a vent of the preform.--

REMARKS

Claims 22 - 28 are pending in the present application, with Claim 22 being independent. In this Amendment, Claims 1-21 have been cancelled, and Claims 22-28 have been newly added. In addition, the Title, Abstract, and Summary of the Invention section have been amended to reflect the elected claims. Further, the specification has been amended, and the amendments are supported by U.S. Patent No. 5,520,572 to Opel et al., and U.S. Patent No. 5,932,026 to Trampusch, both of which were

incorporated by reference in the originally filed application. No new matter has been added.

Applicants reaffirm the election, with traverse, of the Claims of Group I for further prosecution. Traversal is on the grounds that the burden on the Examiner to examine both groups of claims is less than the burden on Applicants/the public to prosecute/search two separate applications/patents.

Applicants submit that cancellation of the non-elected claims does not change the inventorship in the present application.

Claims 1-12 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. Applicants submit that the rejection is moot, as Claims 1-12 have been replaced by newly added Claims 22-28, in which Applicants bore the Examiner's comments in mind. Applicants submit that the mold ejection mechanism of Claim 24 is discussed in the specification at page 7, lines 6-10, and is shown in Figure 1 as reference number 5.

Claims 1-5, 7-9, and 11-12 were rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Trampusch in view of Settles, further in view of Opel et al. Claims 6 and 10 were rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Trampusch in view of Settles, in view of Opel et al., and

further in view of Swain et al. Applicants respectfully traverse these rejections.

Trampusch teaches cleaning a mold *in situ* with a conventional dry ice blasting system by the providing a chamber to reduce the sound emission to such an extent that cleaning of the mold can take place directly at the machine without any adjacent processes being disrupted. Trampusch uses pelletized dry ice in the system, and the size of the individual pellets is not suggested. Trampusch is also silent as to the mass ratio of gas to dry ice, and the gas flow rate.

Settles teaches an abrasive ice-blasting apparatus, and process for manufacturing ice particles near the point of use just before the blast nozzle. The particles are then immediately accelerated through the blast nozzle. Experimental observations included in the description note that the particle sizes varied between 45 and 100 micrometers, or 0.0018 to 0.004 inches. Settles suggests that it is desirable to maximize the ice to gas mass flow rate ratio, with the limitation that the ratio should not be so high as to render the device ineffective. This imprecise statement does not suggest a practical range for effective cleaning to one skilled in the art. In addition, Settles uses frozen water granules as opposed to dry ice particles, and the granule sizes suggested by Settles are on the order of ten times smaller than the granule sizes of the claimed

invention. Although Settles recognizes the role of the mass flow ratio in effective cleaning, it teaches away from the claimed range by indicating that it is desirable to maximize the ratio.

Opel et al. provides a granulator blasting apparatus for high speed delivery of dry ice granules, the granules being conveyed and accelerated directly upon production thereof. Opel et al. incorporates by reference U.S. Patent No. 5,203,794 to Stratford et al., in which a system for accelerating and comminuting dry ice particles is taught.

Stratford et al. teaches predicted particle velocities for the claimed particle size range, the predicted values being within the expected range for the presently claimed method. However, both Opel et al. and Stratford et al. are silent with respect to a suggested gas-to-dry ice mass ratio, the ratio being an important operating criteria for the claimed method of cleaning an injection mold.

Swain et al. is cited for teaching a flow rate of 14 SCFM in a system for cleaning with carbon dioxide snow. However, Swain et al. does not remedy the deficiencies of the combination of Trampusch, Settles, and Opel at al., as discussed above.

In addition, Applicants submit that there does not seem to be any motivation to combine the teachings of Trampusch

and Settles. There is no teaching or suggestion in either reference to combine them, as one is directed to the production of a blast stream of water ice particles, and the other is directed to cleaning of rubber tire molds using dry ice pellets.

Applicants submit that the cited references, taken individually or combined, do not teach or suggest the presently claimed invention. Specifically, they do not teach a method of cleaning an injection mold including the steps of configuring the operating controls of a dry ice blasting system to produce a cleaner flow comprising dry ice granules entrained in a gas with the dry ice granules ranging in size from approximately 0.005 to 0.040 inches in diameter, at a gas-to-dry ice mass ratio ranging from approximately 2.0 to 3.5, and at a gas flow rate ranging from approximately 3 to 50 SCFM; and positioning a nozzle tip of a hand tool from a preform surface to be cleaned; and triggering the operation of the blasting system to initiate the cleaner flow. Accordingly, Applicants submit that Claims 22-28 are patentable over the cited references.

Applicants submit that this application is in condition for allowance in view of the amendments and remarks set forth above. Prompt issuance of a notice thereof is respectfully requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 625-3500. All correspondence should continue to be directed to our address given below.

Respectfully submitted,

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Marked-up Version of the Abstract:

Please amend the Abstract to read as shown below. A mark-up version of the Abstract is attached for the Examiner's convenience.

"A method [and apparatus] of using a dry ice blasting system to clean injection molds in and out of [an] injection molding machines characterized in that it is easy to use and is particularly well suited to cleaning small mold features such as the vents on molding inserts."

Marked-up Version of the Specification:

Please amend the specification to read as shown below. A mark-up version of the specification, showing the changes made thereto, is attached for the Examiner's convenience.

Please delete the paragraphs at page 4, lines 23-27; page 5, lines 1-9; page 5, line 17, through page 6, line 21; page 6, lines 30-32; page 7, lines 1-4; and page 7, lines 7-10.

Please amend the paragraph at page 4, lines 20-22, to read as follows:

"A primary advantage of the present invention is a [nozzle configuration that provides for cleaning in tight areas that would not otherwise be accessible] method to clean smaller targets than is possible with the prior art, as the granule size range is small enough to easily penetrate into the vents of the molding inserts."

Please insert the following new paragraph after the paragraph ending at page 4, line 32:

"According to an aspect of the invention, a method for cleaning an injection mold is provided, comprising the steps of configuring the operating controls of a dry ice blasting system to produce a cleaner flow of dry ice granules entrained in a gas with the dry ice granules ranging in size from approximately 0.005 to 0.040 inches in diameter, at a gas-to-dry ice mass

ratio ranging from approximately 2.0 to 3.5, and at a gas flow rate ranging from approximately 3 to 50 SCFM; positioning a nozzle tip of a hand tool at a distance of preferably between 0.5 and 1.5 inches from a surface to be cleaned; and triggering operation of the blasting system to initiate the cleaner flow."

Please insert the following new paragraphs after the paragraph ending at page 5, line 16:

"In addition, a valve to trigger the gas flow is included on the hand tool.

In addition, the cleaning system is suitable for cleaning the vents of a preform mold."

Please amend the paragraphs at page 7, line 4, to page 8, line 6, to read as follows:

"Referring to FIG. 1, a cleaning operation of a preform mold 1 is depicted using a dry ice blasting system 21. The preform mold 1 is shown in an open position with a suitable distance between the respective cold 2 and hot halves 25 with the mold ejection mechanism 5 positioned to reveal core vents 13 and corresponding sealing face 6 on the neck ring pair 11A & 11B. The nozzle clearance 29 for the hand tool nozzle 17 for the majority of multi-cavity preform molds 1 is in the range of 0.20 to 0.60 inches, with 0.40 being typical. The nozzle

construction employs a venturi construction to accelerate the dry ice particles. In order to avoid clogging in the nozzle 17 the dry ice granule size must be less than the diameter at the narrowest region of the nozzle at its throat. It has been determined that the optimal granule size for a low <u>entrained or cleaner</u> flow stream 15 is preferably between 0.005 and 0.040 inches in diameter, with particle sizes of less than 0.020 being typical. The corresponding gas-to-ice <u>mass</u> ratio preferably being between 2.0 and 3.5, with a value of 3.0 being typical. A low <u>entrained or cleaner</u> flow stream has a gas flow rate preferably between 3 and 50 SCFM, with a value of 25 being typical. For optimal cleaning the cleaning distance 31 between the nozzle tip and the surface to be cleaned (e.g. vent 13) is preferably between 0.5 and 1.5 inches, with a value of 1.0 inch being typical. In order to accommodate the cleaning distance 31 and not have the pistol handle of the hand tool 19 interfere with the neck rings 11A & 11B, the nozzle length is preferably between 2.5 and 12.0 inches, with a length of 6.0 inches being typical.

The hand tool 19 further includes a pistol grip 33 that has a pivoting connection with the nozzle 17 wherein the angular inclination of said nozzle to said pistol grip may be incrementally adjusted. The hand tool further includes at least one light 20 positioned to cast light in the direction of the

nozzle discharge, the light is preferably a light emitting diode. [The hand tool further includes a valve to control said gas pressure and hence the flow rate of the dry ice] <u>In addition, a valve to trigger the gas flow is included on the hand tool</u>."